Bacteria TMDL Development for Bear Garden

Public Meeting Number 1

Central Virginia Community Health Center

New Canton, VA

April 7, 2011

THE Louis Berger Group, INC.

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Agenda

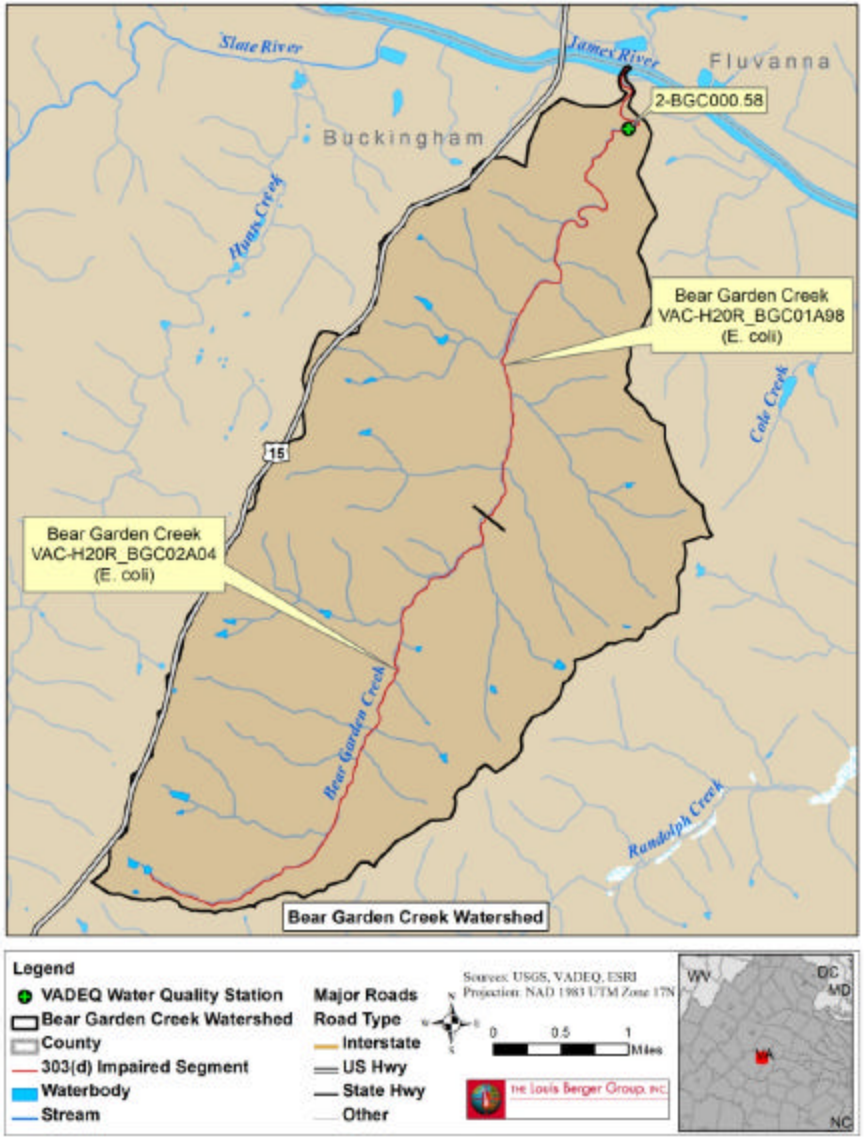
- Meeting Objective
- Impaired Segments
- Watershed Characterization
- Potential Bacteria Sources
- Preliminary Bacteria Source Assessment
- Preliminary Technical Approach
- Next Steps

Objective

- To present and review the steps and the data used in the development of a Bacteria TMDL for the 303(d) listed segment in the Bear Garden watershed

Bacteria Impairments

Based on VADEQ 2010 303(d) List



TMDL ID: VAC-H20R-01-BAC

Assessment Units:

- **VAC-H20R_BGC01A98 (4.67 mi)**
- **VAC-H20R_BGC02A04 (4.51 mi)**

Bacteria Impairments include the entire headwaters of Bear Garden Creek and extends downstream to the mouth at the James River.

The segment was first listed in 2010 for E. coli bacteria impairment (2/12 violations, station 2-BCG000.58).

Bear Garden Creek Total Area: 9,239 acres

Located within the Borders of Buckingham County

Major Roads: State Highway 15 (James Madison Hwy)

Bacteria Water Quality Standards

VADEQ specifies the following criteria (9 VAC 25-260-170) for primary contact recreational uses in freshwater:

E. coli:

- **126 CFU*/100ml (geometric mean: applies to 4 or more samples obtained in 1 calendar month)**
- **235 CFU*/100mL (no more than 10% of the total samples shall exceed)**

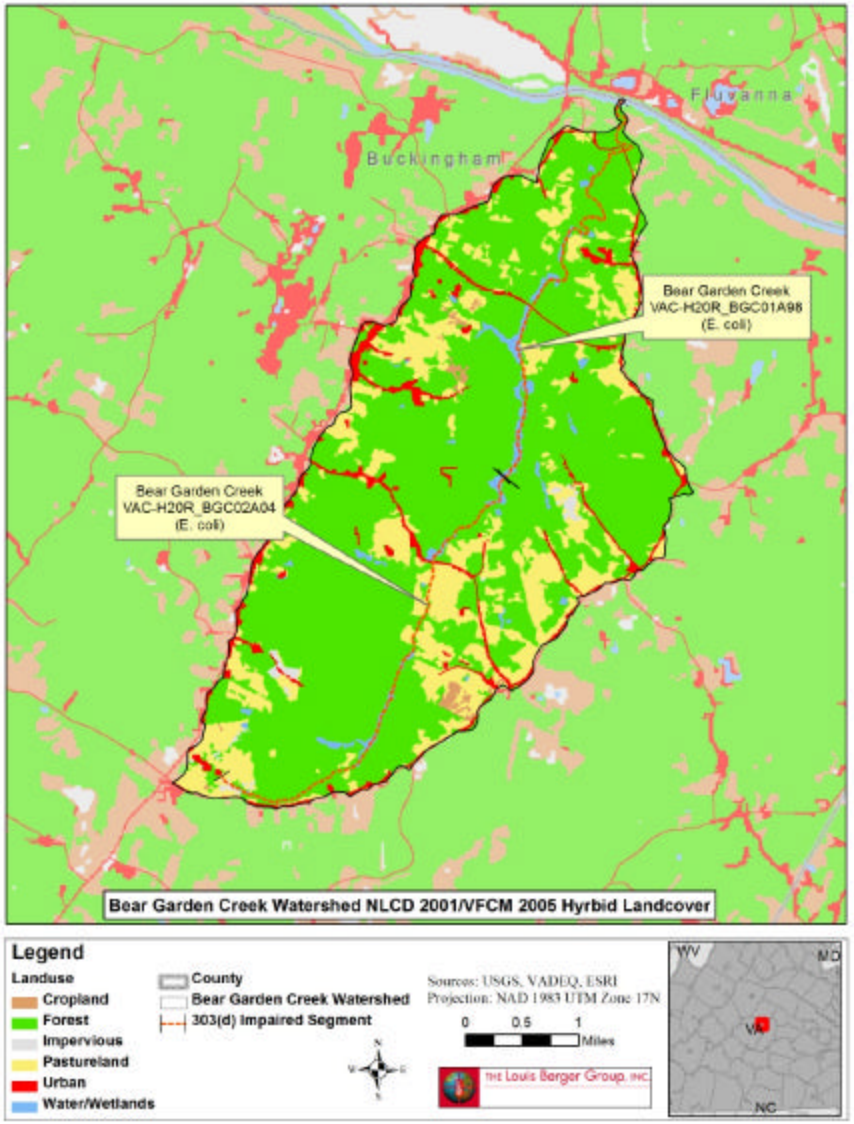
***CFU = colony forming units**

E. coli Data Summary: Bear Garden Creek

Summary of VA DEQ E. coli Exceedances in the Bear Garden Creek Watershed							
Station ID	Number of Samples	Dates Sampled		CFU/ 100 mL		Total Exceed.*	Total % Exceed.
		First	Last	Min	Max		
2-BGC000.58	12	1/30/ 2007	11/24/ 2008	25	1500	2	17%
*Exceedances of the E. coli criterion of 235 CFU/100mL							

Watershed Characterization

Landuse



Bear Garden Creek Total Acres: 9,239

72.7% Forest	(6,716.0 acres)
18.5% Agriculture	(1,709.4 acres)
5.3% Urban	(492.5 acres)
2.2% Water/Wetland	(201.1 acres)
1.3% Other	(120.0 acres)

Based on National Land Cover Database 2001 and Virginia Forest Cover Map 2005 land use data

Potential Bacteria Sources

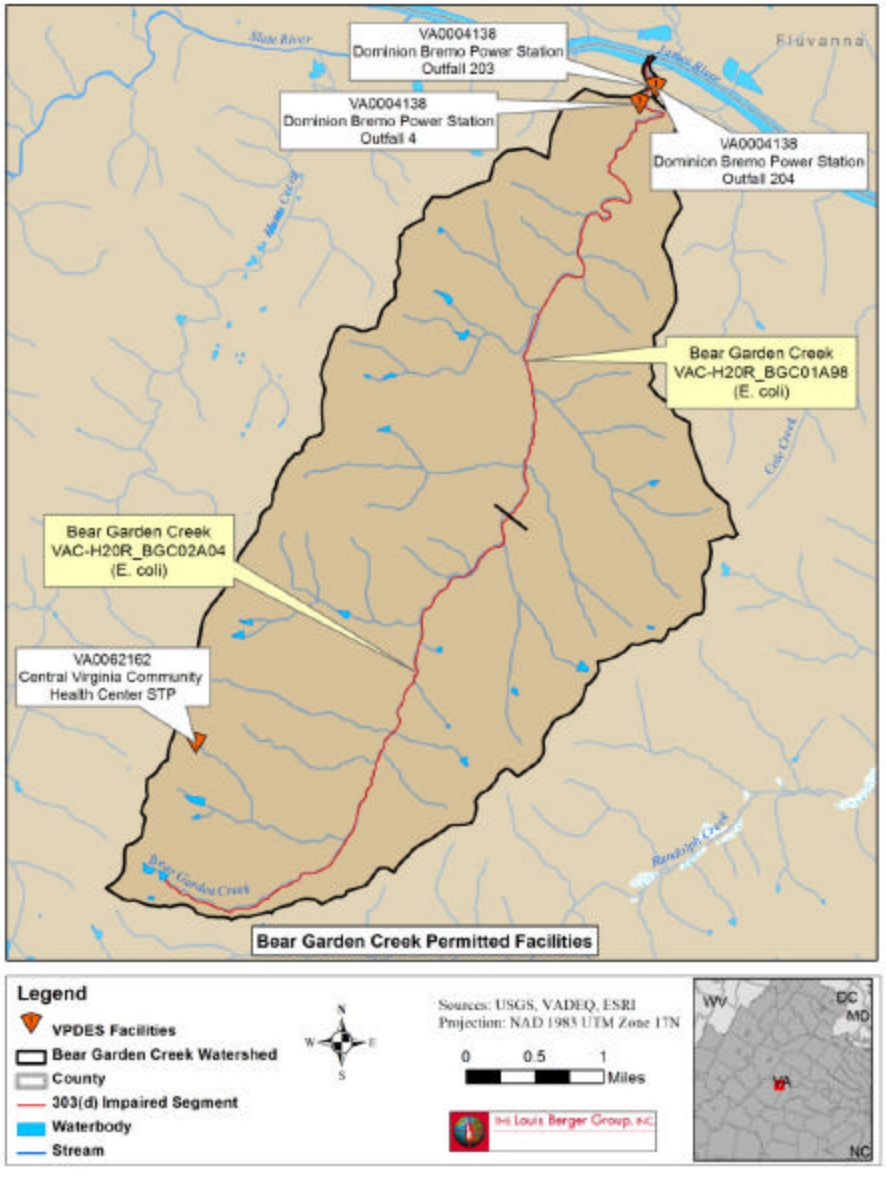
Address bacteria loading from:

- Human Sources (permitted point sources, septic “failing or improperly functioning” systems, straight pipes)
- Livestock
- Wildlife
- Pets

Permitted Facilities

Permitted Facilities in the Bear Garden Creek Watershed			
Permit Number	**Facility Name**	**Outfalls**	**Receiving Stream**
VA0004138	Dominion - Bremo Power Station	3 (4, 203, 204)	Bear Garden Creek
VA0062162	Central Virginia Community Health Center STP	1	Bear Garden Creek Tributary

There were no exceedances of the E. coli limit for the Central Virginia Community Health Center STP

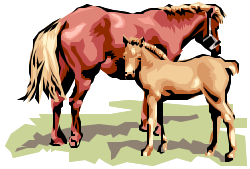


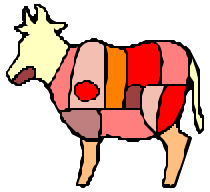
Preliminary Numbers on Septic Failures and Straight Pipes

Counties in the watershed include: Buckingham

Population and Septic Estimates					
Population [1]	Number of Houses[1]	Number of Houses Public Sewer[2]	Number of Houses on Septic Systems[2]	Number of Houses on "Other Means"[2]	Number of Houses with a Failing Septic System[3]
400	175	13	147	15	18
[1] Census 2009 estimates					
[2] Based upon 2009 census estimate and ratio of parameter: 1990 census					
[3] Based on a septic failure rate of 12% (VA DEQ 2005)					

Preliminary Livestock Estimates

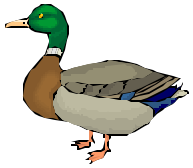





Livestock Present in the Bear Garden Creek Watershed*	
Livestock	**Total**
Beef Cows	109
Milk Cows	109
Other Cattle	177
Hogs/Pigs	624
Sheep and Lambs	30
Chickens	29,572
Horses	14

***Data available from the USDA 2007 Census of Agriculture Report for the state of Virginia at http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp**

Wildlife Estimates: Typical Densities

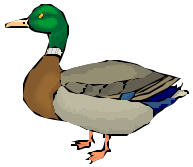


Typical wildlife densities, summarized by DGIF:

Wildlife Densities in the TMDL Watersheds*		
Wildlife type	**Population Density**	**Habitat Requirements**
Deer	17/square mile**	Entire watershed except wetlands, open water, medium/high intensity development
Raccoon (low density)	10/square mile	Upland forest
Raccoon (high density)	50/square mile	Bottomland forest, marsh, swamp, along streams
Muskrat	8 animals/mile	Medium sized stream intersecting pasture fields
Beaver (low density)	1.0/mile	Permanent streams and rivers
Canada Goose	http://migbirdapps.fws.gov/	Based on particular strata for watershed area
Mallard		
Wood Duck		
Black Duck		

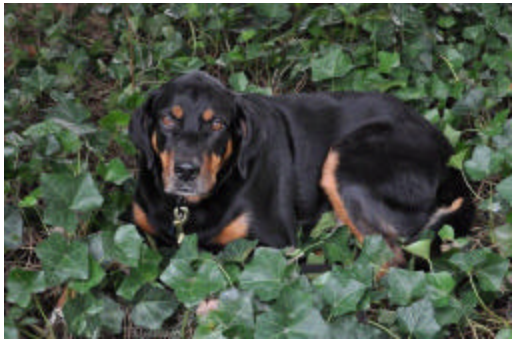
* Source: Department of Game and Inland Fisheries (DGIF)
**Source: UVA population model density estimate

Preliminary Wildlife Estimates



Bear Garden Creek Watershed Wildlife Inventory	
Wildlife Type	**Count**
Deer	228
Raccoon	352
Muskrat	21
Beaver	80
Canada Geese	78
Mallard	8
Wood Duck	6

Preliminary Pet Estimates



Pet Inventory for the Bear Garden Creek Watershed		
Households	**Cats**	**Dogs**
175	124	110

Pet inventories based on:

- Cats: 0.709 per household and
- Dogs: 0.629 per household

American Veterinary Medical Association (AVMA) 2007 estimates

Preliminary Technical Approach

- Bacteria Source Assessment
  - Identify and assess all potential sources of bacteria in the Bear Garden Creek watershed

- EPA's Bacterial Indicator Tool
  - Estimate bacteria contribution from multiple sources (livestock, pets, wildlife) and direct input of bacteria to streams from grazing livestock and failing septic systems
  - Estimate daily accumulated bacteria load per acre for each source
  - Estimate the distribution of the daily accumulated bacteria load

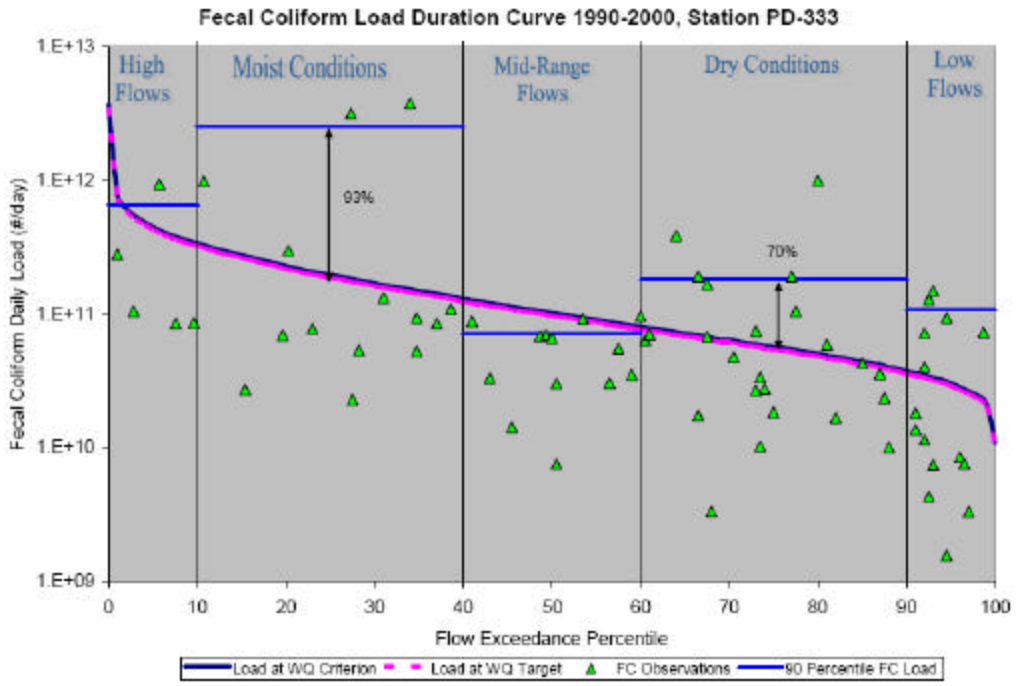
Preliminary Technical Approach

- Develop load duration curves for all flow regimes (high flow, moist conditions, mid-range flow, dry conditions, and low flow) under existing bacteria load and load at bacteria criterion:
  - Existing bacteria load: Use estimated flow based on nearby USGS Gage and measured instream bacteria data collected by VA DEQ (2-BGC000.58)
  - Load at bacteria criterion: Use estimated flow from nearby USGS Gage and the bacteria criterion (235 CFU/100mL)
- Calculate bacteria reductions under each flow regime using the maximum existing bacteria load under each flow regime.
- Allocate the load based on the source distribution estimated from the EPA's Bacterial Indicator Tool

Preliminary Technical Approach

Bacteria Load Duration Curves (US EPA, 2007) :

- Characterizes bacteria loads at different flow regimes
- Displays the relationship between stream flow and loading capacity
- Specifies the percentage of time during which bacteria loads are equaled or exceeded



Source: US EPA (2007)

Next Steps

- Draft Allocation Scenarios
- Technical Advisory Meeting (TAC)
- Draft TMDL Report
- 2nd Public Meeting

Local TMDL Contacts

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Comment period: April 8 through May 7

Reports/presentations available at:
www.deq.virginia.gov/tmdl/mtgppt.html

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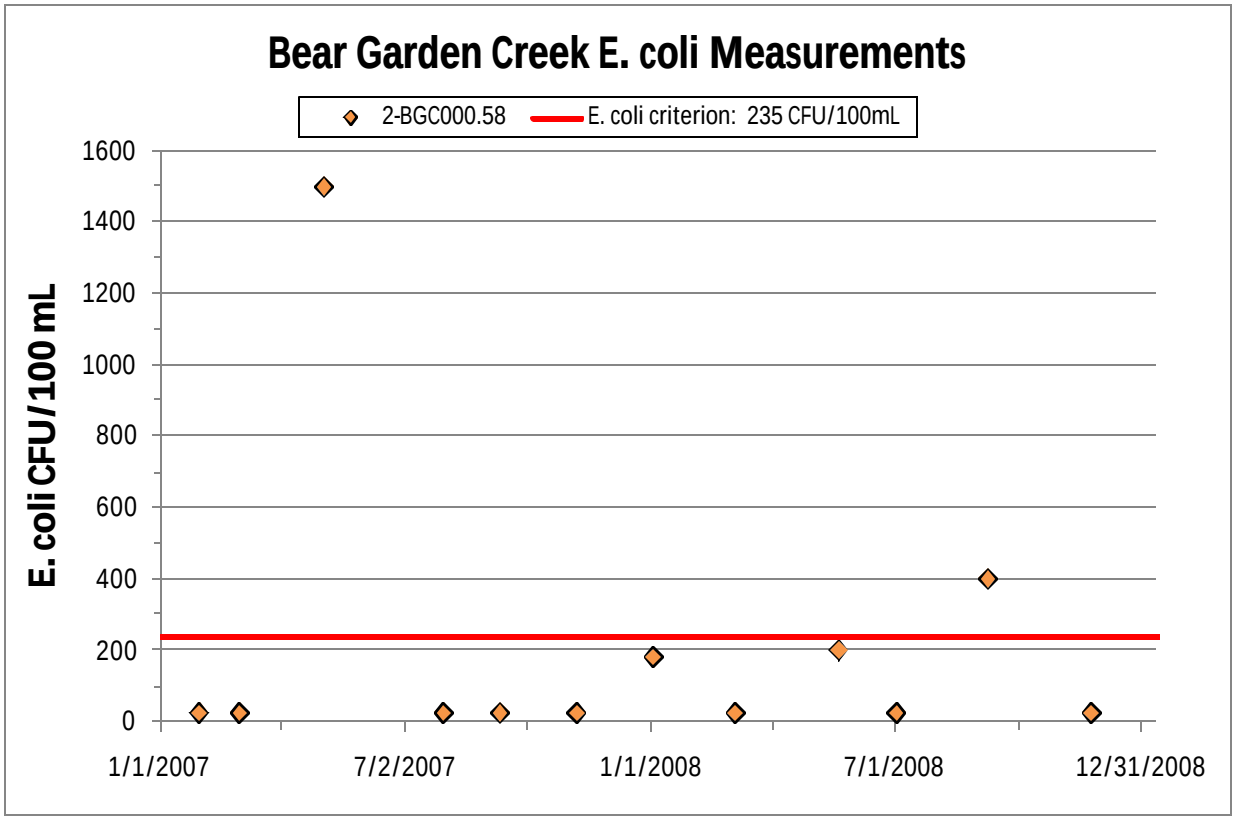
Additional Slides

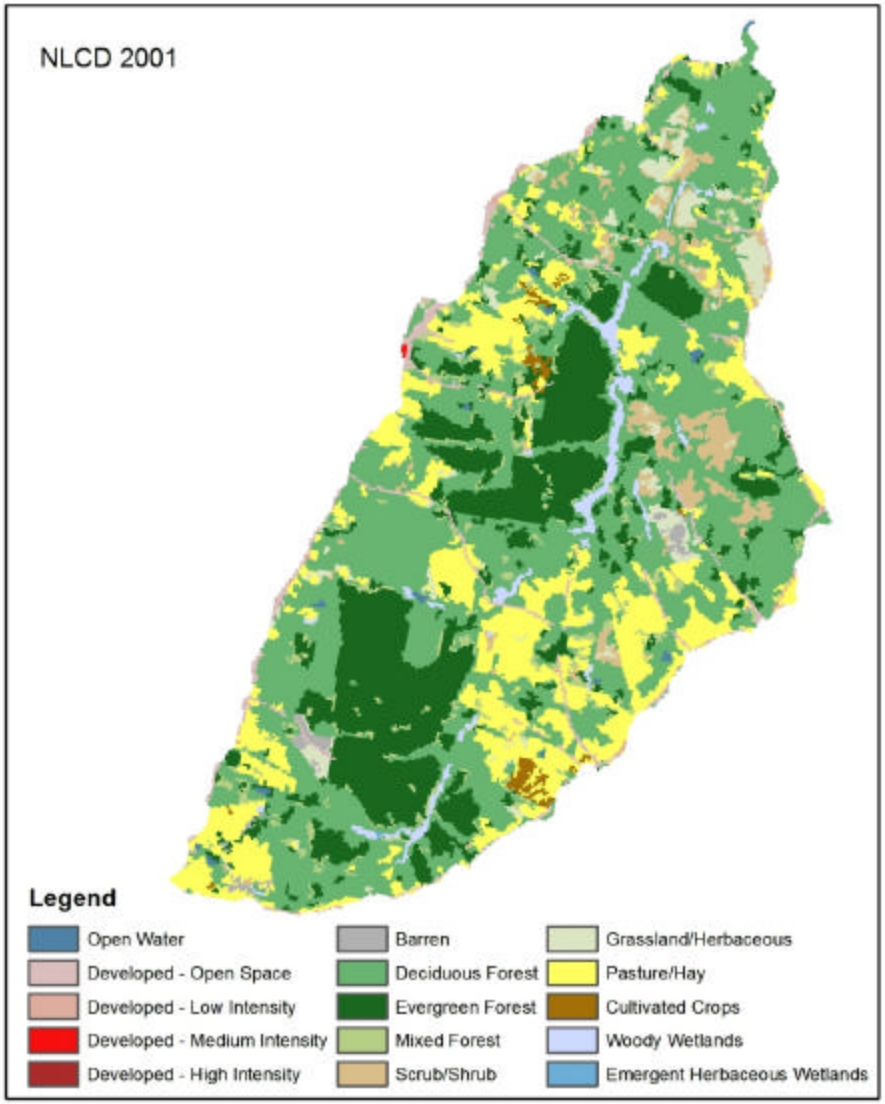
Water Quality Graph

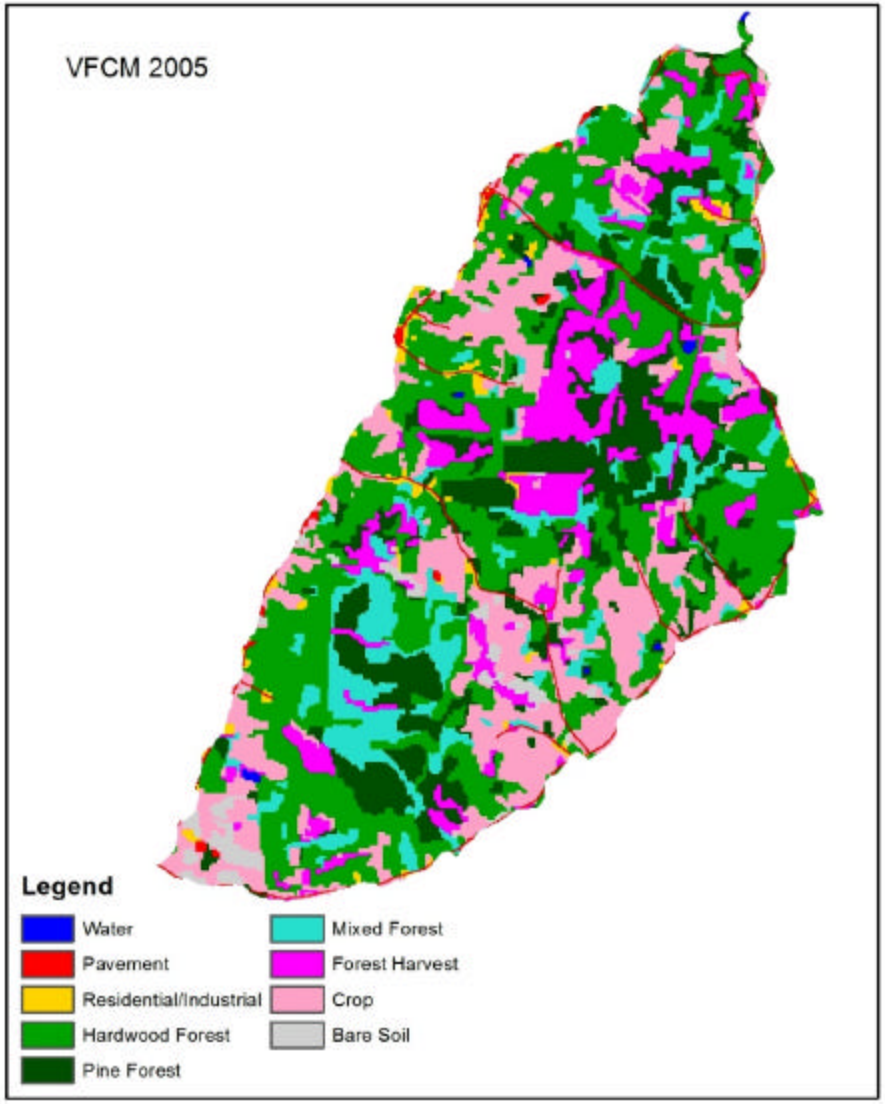


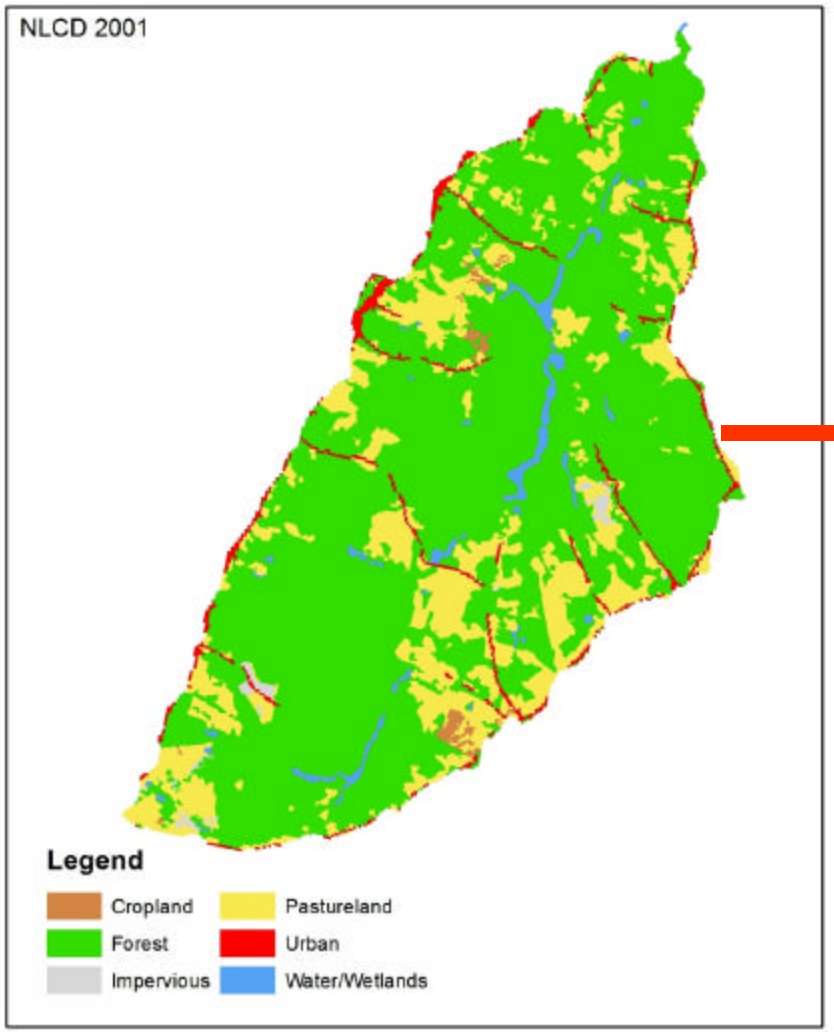
NLCD 2001 vs. VFCM 2005

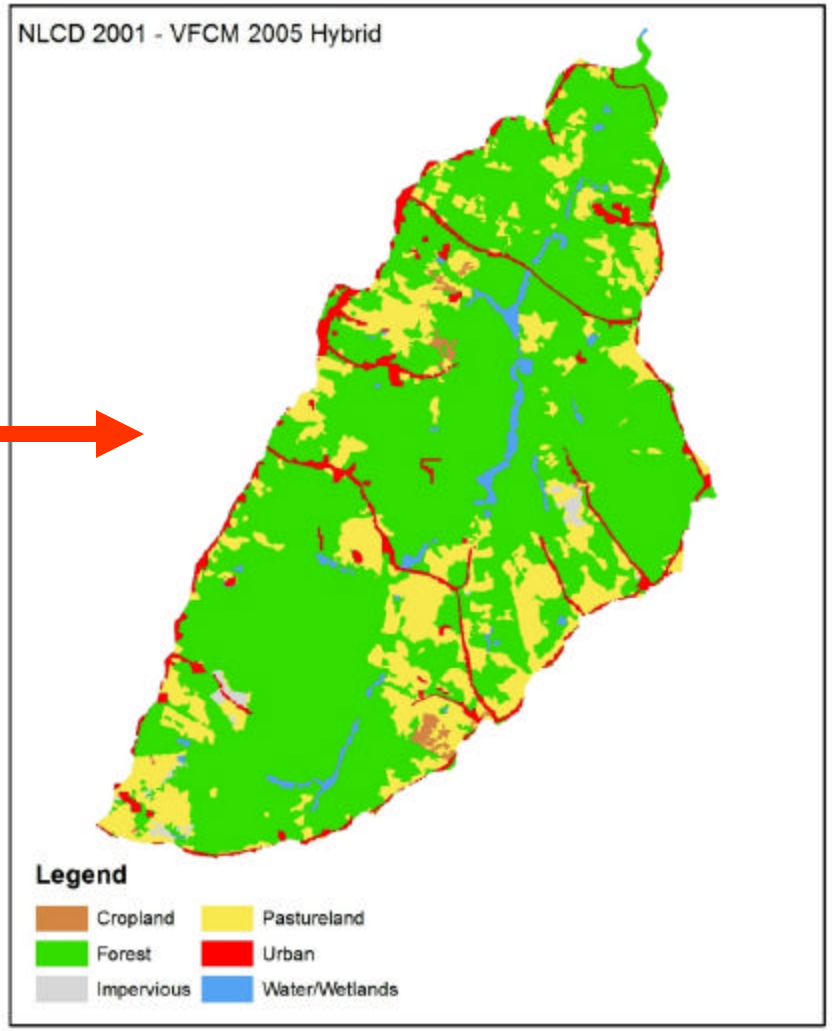
- Most recent NLCD is 2001
- More recent Virginia Department of Forestry 2005 land use data
- DOF and NLCD land use classifications are very different
  - For example urban: pavement, rooftop, and residential/industrial (DOF) vs. low, medium, and high intensity development (NLCD)
- Urban (impervious surface) area has a large impact on watershed hydrology and is therefore important to have the most recent information.
- *Solution: Incorporate the DOF 2005 urban data into the NLCD 2001 data.*

NLCD 2001 vs. VFCM 2005









Land Cover Type	NLCD 2001	Hybrid	Change in Acreage
Cropland	60.6	60.3	-0.3
Forest	6809.6	6716.0	-93.6
Impervious	56.3	56.4	0.1
Pastureland	1846.8	1768.7	-78.1
Urban	257.6	436.1	178.5
Water/Wetlands	207.8	201.1	-6.7